N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

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Research Design

Contributors
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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

Causality
- A (Pressure) → B (Ulcer)

Multicausality
- Years smoking → Heart disease
- High fat diet → Heart disease
- Limited exercise → Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

• Measure of accuracy of a study

• Examined with critique of the following dimensions:
  o Statistical conclusion validity
  o Internal validity
  o Construct validity
  o External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- Controlling the treatment
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- Controlling extraneous variables
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

1. Is there a treatment?
   - No
   - Yes

2. Is the primary purpose examination of relationships?
   - No
   - Yes

   a. Descriptive Design
   b. Quasi-Experimental Study

3. Is the treatment tightly controlled by the researcher?
   - No
   - Yes

   a. Will the sample be studied as a single group?
   - No
   - Yes

   b. Correlational Design
   c. Will a randomly assigned control group be used?

   a. No
   b. Yes

   a. Is the original sample randomly selected?
   - No
   - Yes

   a. No
   b. Yes

   a. Experimental Study
Selecting a Descriptive Design

- Examining sequences across time?
  - No
    - One Group?
      - No
        - Comparative Descriptive Design
      - Yes
        - Descriptive Design
  - Yes
    - Following same subjects across time?
      - No
        - Data collected across time
          - No
            - Cross-sectional design
          - Yes
            - Studying events partitioned across time?
              - No
                - Trend Analysis
              - Yes
                - Repeated measures of each subject
      - Yes
        - Single unit of study
          - No
            - Longitudinal Study
          - Yes
            - Case Study

Research Design  | Cross-sectional design with treatment partitioning  | Longitudinal design with treatment partitioning
A Typical Descriptive Design

Clarification ➔ Measurement ➔ Description ➔ Interpretation

Phenomenon of Interest

Variable 1

Description of Variable 1

Variable 2

Description of Variable 2

Variable 3

Description of Variable 3

Variable 4

Description of Variable 4

Interpretation of Meaning

Development of Hypotheses
A Comparative Descriptive Design

**Group I**
- **{variables measured}**
  - **Describe**
  - **Comparison of Groups on Selected Variables**

**Group II**
- **{variables measured}**
  - **Describe**

**Interpretation of Meaning**
- **Development of Hypotheses**
Selecting the Type of Correlational Design

- **Describe relationships between/among variables?**
  - Descriptive correlational design

- **Predict relationships between/among variables?**
  - Predictive correlational design

- **Test theoretically proposed Relationships?**
  - Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Description of variable

Development of Hypotheses

Research Variable 2
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

Control Group?
- No
  - Pretest?
    - No
      - One-group post-test only design
    - Yes
      - Repeated Measures?
        - No
          - Strategy for Comparison
            - No
              - Suggest Reevaluating design
            - Yes
              - Compare treatment & control conditions?
        - Yes
          - Repeated Measures?
Selecting The Type of Experimental Design

- **Pretest**
  - No
    - Post-test only control group design
  - Yes
    - **Repeated Measurements?**
      - No
        - Examine effects of confounding variables?
          - No
            - Multiple sites?
              - Pretest/post-test control group design
          - Yes
            - Blocking?
              - No
                - Pretest/post-test control group design
              - Yes
                - Randomized clinical trials
                  - No
                    - Comparison of multiple levels of treatment
                      - No
                        - Examination of complex relationships among variables in relation to treatment
                      - Yes
                        - Nested Designs
                    - Yes
                      - Randomized Block Design

# Pretest-Post Test, Control Group Designs

## Research Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Randomly selected control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRETEST</td>
<td>PRETEST</td>
</tr>
<tr>
<td>Treatment:</td>
<td>Under control of researcher</td>
</tr>
<tr>
<td>Findings:</td>
<td>Comparison of pretest and post-test scores</td>
</tr>
<tr>
<td></td>
<td>Comparison of experimental and control groups</td>
</tr>
<tr>
<td></td>
<td>Comparison of pretest-post-test differences between samples</td>
</tr>
<tr>
<td>Uncontrolled threats to validity:</td>
<td>Testing Mortality</td>
</tr>
<tr>
<td></td>
<td>Instrumentation Restricted generalizability as control increases</td>
</tr>
</tbody>
</table>
Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Measurement of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:** Comparison of experimental and control groups


**Uncontrolled threats to validity:** Instrumentation, Mortality, Limited generalizability as control increases
### Nested Design

#### Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>Unit A</th>
<th>Unit B</th>
<th>Unit C</th>
<th>Unit D</th>
<th>Unit E</th>
<th>Unit F</th>
<th>Unit G</th>
<th>Unit H</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRN Medication</td>
<td>Unit A</td>
<td>Unit B</td>
<td>Unit C</td>
<td>Unit D</td>
<td>Unit E</td>
<td>Unit F</td>
<td>Unit G</td>
<td>Unit H</td>
</tr>
</tbody>
</table>

#### Primary Nursing Care

<table>
<thead>
<tr>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
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<tr>
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<td>Unit F</td>
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<td>Unit G</td>
<td>Unit H</td>
</tr>
</tbody>
</table>

*New approach: “Around the clock” medication*
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically
- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design